

**MEMORANDUM OF UNDERSTANDING (MOU)  
BETWEEN THE**

**EARTH OBSERVING SYSTEM – AURA PROJECT**

**AND THE**

**FLIGHT SOFTWARE BRANCH**

**FOR**

**EOS AURA SPACECRAFT BUS  
FLIGHT SOFTWARE  
PROJECT-LEVEL VERIFICATION AND VALIDATION**

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1/19/01  
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## Introduction

This Plan defines the major aspects of the support to be provided by the Flight Software Branch (FSB) to the Earth Observing System - Aura (EOS Aura) Project and outlines the tasks to be performed by the FSB to provide Project-Level Verification and Validation (PVV). This Plan also defines the support and resources to be provided by the EOS Aura Project to the FSB to meet these objectives.

The FSB shall provide PVV of the EOS Aura flight software prior to launch. To accomplish this the FSB shall utilize one of three software development and validation facilities developed by the EOS Aura spacecraft contractor. The facility delivered to GSFC for the purpose of PVV (called the Independent Verification and Validation Facility – IVVF) shall be functionally equivalent to the contractor's facility (called the Software Development And Validation Facility – SDVF) that will be used for original flight software development, Verification and Validation, and post launch sustaining engineering<sup>1</sup>. Like the contractor's SDVF, the EOS Aura IVVF shall include software simulation capabilities for high fidelity, real time, closed loop flight software validation. It shall also include software development tools.

This plan will become effective upon approval by the EOS Aura Project and the Information Systems Center (ISC), and shall remain effective until the end of orbital verification. Once approved, any changes to this plan, including termination, will follow the normal EOS Aura and ISC control procedures. The FSB and the EOS Aura Project shall review and appropriately update this MOU on an annual basis.

## Code 582 Responsibilities

The FSB shall provide the following:

1. PVV of the flight software that resides on the four EOS Aura 1750A controllers: the Command & Telemetry Controller (CTC), the Power Controller (PC), the Guidance, Navigation, and Control (GN&C) Controller (GNCC), and the Instrument Support Controller (ISC). This PVV includes simulation of the flight/ground system for the purposes of operations scenario checkout.
2. Development and maintenance of a PVV test plan for the EOS Aura flight software. This document will be used as the basis for flight software PVV testing.
3. Development and maintenance of PVV simulation scenarios for the purpose of flight software checkout.
4. Civil service staff to lead the PVV activities.

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<sup>1</sup> After orbital verification (launch plus ninety days), the FSB shall assume responsibility for the post launch maintenance of the EOS Aura flight software. Management direction and funding for this effort shall be provided by Code 428, the Earth Sciences Operations Project Office.

5. Management and technical direction of support contractors.
6. Support of development and test activities, in collaboration with the EOS Aura flight software development team. This support may include documentation and code reviews, major project reviews, flight software acceptance test planning, test procedure review, test results analysis, integration and test support and actual flight software implementation.
7. Management, development, and maintenance of an operations support onboard computer tool set.
8. Support of end to end system testing and flight/ground system interface checkout.
9. Software and hardware configuration management and operation of the EOS Aura IVVF. Maintenance of commercial hardware and software elements of the IVVF.
10. Facilities (space, power, air conditioning) for accommodating the EOS Aura IVVF.
11. Configuration of the EOS Aura IVVF in FSB facility space, with facility recertification as a collaborative effort between the EOS Aura Project and FSB.
12. Launch support during orbital verification.
13. Technical and management consultation support to the EOS Aura Project as needed.
14. Periodic FSB status review presentations to the EOS Aura Project.

#### Code 424 Responsibilities

The EOS Aura Project shall provide the following:

1. Overall management direction of and funding for the FSB PVV efforts for the EOS Aura flight software. The EOS Aura Project shall provide management direction and funding up until launch plus three months.
  2. Flight software, related development support software, simulation software, EOS Aura IVVF software, and other program and data products as agreed upon.
  3. Flight software related deliverable documentation including, but not limited to:
    - a) Flight Software Requirements Specification;
    - b) Flight Software Design documentation including design notes;
    - c) Interface Control Documents;
    - d) Flight Software Operations Document;
    - e) Flight Software Build and Acceptance Test plans, procedures, test data, and test results;and
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- f) Flight Software User's Guide.
4. All documentation associated with the development support and simulation tools including, but not limited to:
    - a) IVVF Requirements Specification;
    - b) IVVF design documentation – including design notes and unit development folders;
    - c) IVVF Build and Acceptance Test plans;
    - d) Test procedures, test data, test results; and
    - e) IVVF User's Manual.
  5. The documentation should be provided as it is developed throughout the development life cycle so as to allow FSB engineers insight into the evolving system.
  6. Funding for EOS Aura IVVF commercial product incidental items (PCs, racks, etc.) necessary for establishing the EOS Aura IVVF in FSB facility space.
  7. Informal training, consultation, and technical support to the FSB from the development organization, on an as needed basis, for the EOS Aura flight software and the EOS Aura IVVF environments.
  8. Maintenance of all EOS Aura unique hardware components until launch plus three months, possibly arranged via contractor funding through the FSB.
  9. Funding for FSB support contractors as specified in the Funding section of this MOU.

### Funding

The following is the projected Project funding (in thousands of dollars) for the activities described in this MOU up through orbital verification. These figures assume a launch date of June, 2003 and will be reviewed annually through the center workforce planning process.

| FY 2000 | FY 2001 | FY 2002 | FY 2003 |
|---------|---------|---------|---------|
| \$75    | \$180   | \$660   | \$605   |

The FSB will provide the following civil service and contractor staffing (in man years) in support of the EOS Aura FSW PVV. The current funding levels support the total number of staff personnel. Some reassignments and changes based on mission needs and individual skills may occur. These figures assume a launch date of June, 2003.

#### Civil Servant Staffing Profile

| FY 2000 | FY 2001 | FY 2002 | FY 2003 |
|---------|---------|---------|---------|
| 0.1     | 0.2     | 0.5     | 0.8     |

#### Contractor Staffing Profile

| FY 2000 | FY 2001 | FY 2002 | FY 2003 |
|---------|---------|---------|---------|
| .5      | 1       | 4       | 3.5     |

## Schedule

The schedule shows the basic mission events as well as details on specific time frames for test activity commencement, test activity product development and delivery, EOS Aura IVVF hardware component procurements and delivery requirements for the unique IVVF elements.

